UNO-4672

Intel Pentium M/Celeron M Fanless Box PC with 6 x LAN, 10 x COM, 8 x DI, 8 x DO, PC/104+

User Manual

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This manual is for UNO-4672.

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Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details. If you think you have a defective product, follow these steps:

Step 1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any on-screen messages you get when the problem occurs.

Step 2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.

Step 3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.

Step 4. Carefully pack the defective product, a fully completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.

Step 5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

CE

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Technical Support and Assistance

Step 1. Visit the Advantech web site at **www.advantech.com/support** where you can find the latest information about the product.

Step 2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
- Product name and serial number
- Description of your peripheral attachments
- Description of your software (OS, version, software, etc.)
- A complete description of the problem
- The exact wording of any error messages

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User's Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:

a. The power cord or plug is damaged.

b. Liquid has penetrated into the equipment.

c. The equipment has been exposed to moisture.

d. The equipment does not work well, or you cannot get it to work according to the user's manual.

e. The equipment has been dropped and damaged.

f. The equipment has obvious signs of breakage.

15. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -

20° C (-4° F) OR ABOVE 55° C (131° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.

16. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

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CHAPTER 1

Overview

This chapter provides an overview of UNO-4672's specifications.

Sections include:

- Introduction
- Hardware Specifications
- Safety Precautions
- Chassis Dmensions
- Packing List

Chapter 1 Overview

1.1 Introduction

UNO-4672 is an embedded Application Ready Platform (ARP) that can shorten development time and offers rich networking interfaces to fulfill extensive needs. UNO-4672 is designed to be a total solution for network enabled Application Ready Platforms.

Leveraging field-approved and worldwide approved real-time OS technology, Advantech UNO-4672 series provides a Windows CE .NET and Windows XP Embedded ready solution, and supports several standard networking interfaces, such as Ethernet, RS-232/422/485 and more. Because of its openness, great expansion capability and reliable design (fanless and diskless), the UNO-4672 series are ideal embedded platforms for implementing custom applications for diverse applications.

Target on Data Server and Communication Gateway in Substations

Advantech UNO-4672 has been defined and designed to be compliant with IEC-61850-3, which has been defined as an international hardware standard of communication network and system in power substations. In modern power substation, this standard facilitate the management to large number of devices and enable the various devices to communicate with one another. UNO-4672 is a ready and certified platform to serve all these requirement.

Open Architecture Designed for Automation

For applications demanding customized control, an UNO-4672 that uses more flexible, off-the-shelf technology is a better option. UNO-4672 uses off-the-shelf components such as an x86 processor, an Ethernet chip set, CompactFlash., and DRAM. At the same time, the UNO-4672 unit can broadcast the process data through the Ethernet and share the data with operators and managers. By using off-the-shelf components, machine builders can customize the control scheme they use for other machines that require multiple inputs, optimized control, or Ethernet communication. So, UNO-4672 offers the I/O connectivity of PCs with options like: 6 x Ethernet (2 x 10/100/1000 Base-T, 4 x 10/100 Base-T), 10 x Serial ports (2 x RS-232, 8 x RS-232/422/485), 4 x USB ports (1 x Front, 2 x Rear, 1 x Internal), 2 x CompactFlash and VGA interface for display panels.

Robust IO Isolate System from Electrical Noise

UNO-4672 is designed for the applications in substation where is supposed to have certain electric interference. Equipping with isolated power, isolated DI/DO and isolated communication ports, UNO-4672 has high resistance toward electrical noise. It has been proved not only can work well in substation but also suitable for any harsh applicaitons

An Industry-Proven Design

Industrial applications require controllers with high-vibration specifications and a wide temperature range. Controllers in industrial environments require flexible and stable mounting, and many machine builders underestimate the need for rugged controllers because their applications are mounted in an industrial enclosure. UNO-4672 has a special design without the weaknesses of a standard PC. No fan, and no HDD prevent dust and vibration problems. With a smart mechanical design, UNO-4672 can meet 50 G shock (with CompactFlash), 2 G vibration (with CompactFlash), up to 55° C operating temperature (tested under 100% CPU loading) and almost anything an industrial environments demand.

Designed to Fit Comfortably Into Racks

In completely new packaging, UNO-4672 has standard 2U rack size as 440 x 220 x 88 mm (W x H x D) could fit your rack. The rear IO connection and indicator LEDs on the front panel for all ports and modes highly simplify monitoring for operation and maintenance in the rack. You could easily mount UNO-4672 on rack, manage all UNOs in one rack and easily develop your application on rack.

Flexible Networking Options

The Advantech UNO-4672 offers two ways to connect to a network: Ethernet and Modem. The six built-in Ethernet ports provide high-speed networking capability up to 1 Gbps. And through UNO-4672's isolated serial COM ports, you could link industrial modems to offer the most popular and easiest networking method by PSTN. UNO-4678 provides 2 channels full 9-pins standard RS-232 isolated serial COM ports and 8 channels 5-pins isolated serial COM ports with RS-232/422/485 selectable. These ports all equip with surge and isolation protection up to 2000 VDC ,protecting your system from abrupt high voltage attack and accident or damage in harsh environments.

Popular Operating Systems and Rapid Application Development

The Advantech UNO-4672 supports the popular off-the-shelf Microsoft Windows 2000/NT/XP operating systems and the Linux operating system. UNO-4672 also features pre-built Microsoft Windows XP embedded or Windows CE solutions offering a pre-configured image with optimized onboard device drivers. Microsoft Windows CE and XP Embedded are compact, highly efficient, and real-time operating systems that are designed for embedded systems without a HDD. There is no need to waste time and energy on developing onboard device drivers or using the Platform Builder to build a custom Windows CE image, they have all been done for the Advantech UNO-4672 series! Through the built-in run-time library and Software Development Kit (SDK), the UNO-4672 series leverages your existing Windows-based programming skills to rapidly develop applications.

1.2 Hardware Specifications

General

Certifications	IEC-61850-3, CE, FCC Class A
Dimensions (W x D x H)	2U (440 x 220 x 88 mm) (17.3” x 8.6” x 3.4”)
Enclosure	SECC
Mounting	Rack
Power Consumption	45 W (Typical)
Power Input	AC: 90 - 250 VAC (47~400Hz) or DC: 106 - 250 VDC With isolation protection
Weight	6.0 kg
OS Support	Windows XP Embedded SP2, Windows 2000/ XP, Windows CE .NET 6.0, Linux

System Hardware

CPU	Pentium M 1.4 GHz / Celeron M 1 GHz
Indicators	LEDs for Power, Storage, Alarm for battery backup SRAM, Diagnosis (programmable), LAN (Active, Status) and Serial (Tx, Rx)
Memory	1 GB DDR DRAM
Storage	
SSD:	2 x internal type I/II CompactFlash slots
HDD:	One built-in 2.5" SATA HDD bracket
Display	DB15 VGA connector, 1600x1200 @ 85Hz
PC/104 Slot	PC/104+ supports +3.3V & 5V power
Watchdog Timer	Programmable 256 level timer interval, from 1 to 255 sec
Battery Backup SRAM	512 KB

I/O Interface

Serial Ports

2 x DB-9 connectors with 9-wired RS-232

8 x screw terminals with 5-wired RS-232/422/485 selectable

Automatic RS-485 data flow control

2000 V_{DC} surge protection & isolation

Serial Port Speed

COM1,COM2: RS-232: 50~115.2 kbps

COM3~COM10: RS-232: 50~230.4 kbps

RS-422/485: 50~921.6 kbps (Max.)

LAN 2 x 10/100/1000 Base-T RJ-45 ports

4 x 10/100 Base-T RJ-45 ports

USB 4 x USB ports, UHCI, Rev. 2.0 compliant

(1 x front, 2 x rear and 1 x internal ports)

Digital Input 8-ch wet contact DI

Logic 0: 0 ~ 3 V_{DC}; Logic 1: 10 ~ 50 V_{DC}

2,000 V_{DC} isolation, 2,000 VDC ESD protection

70 V_{DC} over-voltage protection

Interrupt handling: IRQ 7

Photo couple response: 100 ?s

Digital Output 8-ch DO

2,000 V_{DC} isolation and

200 mA max/channel sink current

Keep output status after system hot reset

5 ~ 40 V_{DC} output range and 10 kHz speed

Timer/Counter Counter Source : DI1 & DI3, jumper selected

Pulse output : DO2 & DO3, jumper selected

Can be cascaded as one 32-bit counter/timer

Support down counting, preset counting value

Timer time base : 100 kHz, 10 kHz, 1 kHz, 100Hz

Environment

Humidity	95% @ 40° C (non-condensing)
Operating Temperature	-20 ~ 55° C (-4 ~ 131° F) (100% CPU load)
	-20 ~ 65° C (-4 ~ 149° F) (50% CPU load)
Shock Protection	IEC 68 2-27
CompactFlash:	50 G, half sine, 11 ms
HDD:	20 G, half sine, 11 ms
Vibration Protection	IEC 68 2-64 (Random 1 Oct./min, 1hr/axis.)
CompactFlash:	2 Grms @ 5 ~ 500 Hz,
HDD:	1 Grms @ 5 ~ 500 Hz

1.3 Safety Precautions

The following,messages informs how to make each connection. In most cases, you will simply need to connect a standard cable.

Warning!

Always disconnect the power cord from your chassis whenever you are working on it. Do not connect while the power is on. A sudden rush of power can damage sensitive electronic components. Only experienced electronics personnel should open the chassis.

Caution!

Always ground yourself to remove any static electric charge before touching UNO-4672. Modern electronic devices are very sensitive to static electric charges. Use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag.

Attention!

If DC voltage is supplied by an external circuit, please put a protection device in the power supply input port.

1.4 Chassis Dimensions

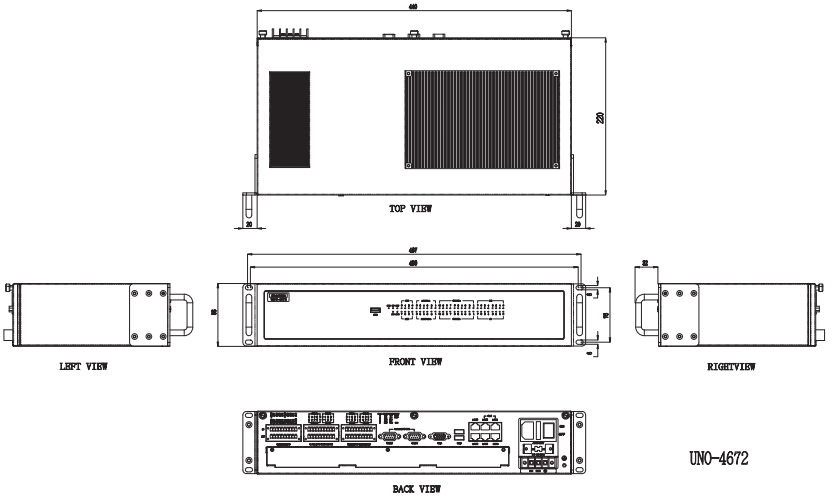


Figure 1.1: Chassis Dimensions

1.5 Packing List

The accessory package of UNO-4672 contains the following items:

(A) UNO-4672

(B) 2 x rack mounting kit

(C) 12 x screw for rack mount kit

(D) 2 x front handles

(E) 4 x screws for front handles

(F) 6 x 10-pins green screw terminals

(G) 1 x SATA signal cable

(H) 1 x SATA power cable

(I) 4 x screws for SATA HDD installation

(J) 1x clamp for USB dongle

(K) 2x screws for USB clamp

(L) UNO series Driver and Utility DISC

(M) 1 x warranty card

CHAPTER 2

Hardware Functionality

This chapter shows how to setup the UNO-4672's hardware functions, including connecting peripherals, setting switches and indicators.

Sections include:

- Overview
- LED Indicators
- Power Input
- RS-232 Interface
- RS-232/422/485 Interface
- LAN / Ethernet Connector
- USB Ports
- VGA Display
- Battery Backup SRAM
- Onboard Isolated Digital Input
- Onboard Isolated Digital Output
- Onboard Isolated Counter/Timer
- LED & Buzzer for System Diagnosis
- PC/104+

Chapter 2 Hardware Functionality

2.1 Overview

The following two figures show the indicators and connectors on UNO-4672. The following sections give you detailed information about function of each peripheral.

Figure 2.1: UNO-4672 Front Panel

Figure 2.2: UNO-4672 Rear Panel

2.2 LED Indicators

The LEDs in the front panel can be divided into 4 groups.

2.2.1 System Status Indicators

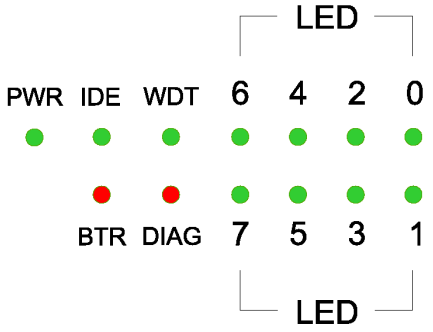


Table 2.1: Definition of System Status Indicators

Item	LED	Status	Description
1	PWR	Green	System power is on
		Off	System power is off
2	IDE	Green	Data being received/ transmitted between storage devices
		Off	No Data being received/ transmitted between storage devices
3	WDT (reserved)	Green	443 WDT trigger the LED for alarm
		Off	Default
4	BTR	Red	Battery for SRAM should be replaced
		Off	Status of battery for SRAM is OK
5	DIAG	Red/ Flicking	LED turn on by program
		Off	LED turn off by program (default)
6	LED (Port 0 ~ 7)	Green	LED turn on by program
		Off	LED turn off by program (default)

2.2.2 LAN Status Indicators

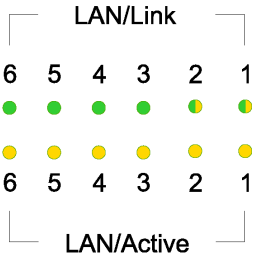


Table 2.2: Definition of LAN Status Indicators

Item	LED	Status	Description
1	LAN/Link (Port 1~2)	Orange	1 Gbps network link
		Green	100Mbps network link
		Off	10Mbps network link or invalid network link
2	LAN/Link (Port 3~6)	Green	100Mbps network link
		Off	10Mbps network link or invalid network link
3	LAN/Active (Port 1~6)	Orange	Ethernet date being received/ transmitted
		Off	No Ethernet data being received/ transmitted

2.2.3 Serial Communication Status Indicators

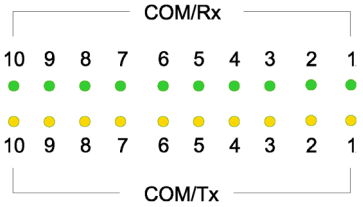


Table 2.3: Definition of Serial COM Status Indicators

Item	LED	Status	Description
1	COM/Rx (Port 1~10)	Green	Serial port data being received
		Off	No data being received
2	COM/Tx (Port 1~10)	Orange	Serial port data being transmitted
		Off	No data being transmitted

2.2.4 Digital Input/Output Status Indicators

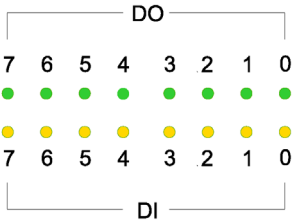


Table 2.4: Definition of DI/DO Status Indicators			
Item	**LED**	**Status**	**Description**
1	DO(Port 0~7)	Green	DO port is activated
		Off	DO port is inactivated
2	DI(Port 0~7)	Orange	DI port has signal input
		Off	DI port has no signal input

2.3 Power Input

The UNO-4672 support AC/DC power input to fulfill the need of field site. Following table shows the specification of the power input.

Table 2.5: AC/DC Power Input			
AC/DC	**Volt. Range**	**Power Rating**	**Connector Type**
AC	90-250V	1.6-0.8A, 47-400 Hz	3P Power Jack
DC	106-250V	1.6-0.8A	3Pin Screw Terminal

The function of each part is described as below:

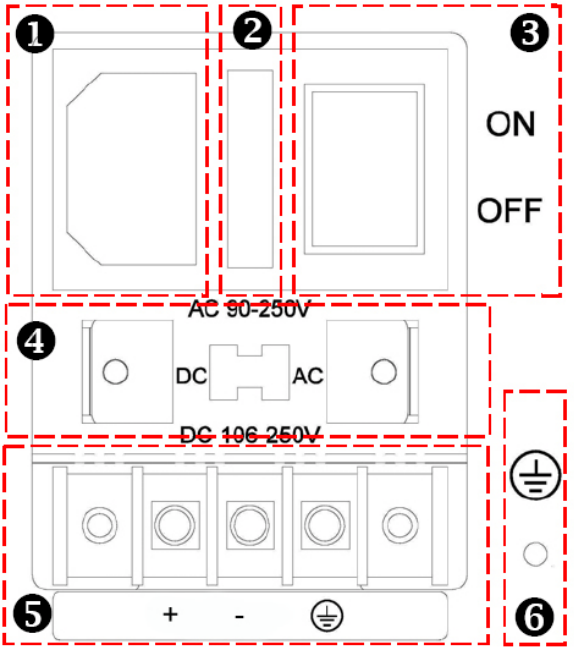


Table 2.6: AC/DC Power Input Function Introduction	
Item	**Function Description**
1	Power jack for AC power input
2	Fuse for AC power input; one backup fuse inside
3	AT power switch for AC/DC power input
4	Switch for selecting AC or DC power input
5	Screw terminal for DC power input
6	Screw for connecting chassis to field ground

2.4 RS-232 Interface (COM1,COM2)

The UNO-4672 offers two standard RS-232 serial communication interface port: COM1 and COM2. Please refer to A.2 for pin assignments. The IRQ and I/O address of COM1 and COM2 are listed below:

Table 2.7: IRQ and I/O Address for COM1,COM2

COM No.	IRQ	I/O Address
COM1	IRQ4	3F8H
COM2	IRQ3	2F8H

2.5 RS-232/422/485 Interface (COM3~COM10)

The UNO-4672 offers eight RS-232/422/485 serial communication interface ports: COM3 to COM10. Please refer to Appendix A.2 for their pin assignments. The default setting of COM3 to COM10 are RS-232.

2.5.1 OXmPCI954 UARTs with 128 bytes FIFO

Advantech UNO-4672 comes with Oxford OXmPCI954 UARTs containing 128 bytes FIFOs.

2.5.2 RS-422/485 Detection

In RS-422/485 mode, UNO-4672 automatically detects signals to match RS-422 or RS-485 networks. (No jumper change required)

2.5.3 Automatic Data Flow Control Function for RS-485

In RS-485 mode, UNO-4672 automatically detects the direction of incoming data and switches its transmission direction accordingly. So no handshaking signal (e.g. RTS signal) is necessary. This lets you conveniently build an RS-485 network with just two wires. More importantly, application software previously written for half duplex RS-232 environments can be maintained without modification.

2.5.4 Terminal Resistor (JP9~JP16)

The onboard termination resistor (120 ohm) for COM3~COM10 can be used for long distance transmission or device matching. (Default Open.) Please also refer to Table 2.9 for the mapping table of Jumper and COM port.

Table 2.8: Jumper setting of terminal resistor

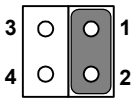
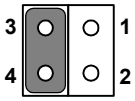
JPx	Description
	Add termial resistor on Tx+/Tx- of RS-422 or Data+/Data- of RS-485
	Add termial resistor on Rx+/Rx- of RS-422

Table 2.9: Mapping table of Jumper/DIP for COM port

COM port	Jumper for RS-232 and RS-422/485 selection	SW2 DIP switch for Auto-flow control	Jumper for Terminal Resistor
COM3	JP2	DIP1	JP10
COM4	JP3	DIP2	JP11
COM5	JP1	DIP3	JP9
COM6	JP4	DIP4	JP12
COM7	JP6	DIP5	JP14
COM8	JP7	DIP6	JP15
COM9	JP5	DIP7	JP13
COM10	JP8	DIP8	JP16

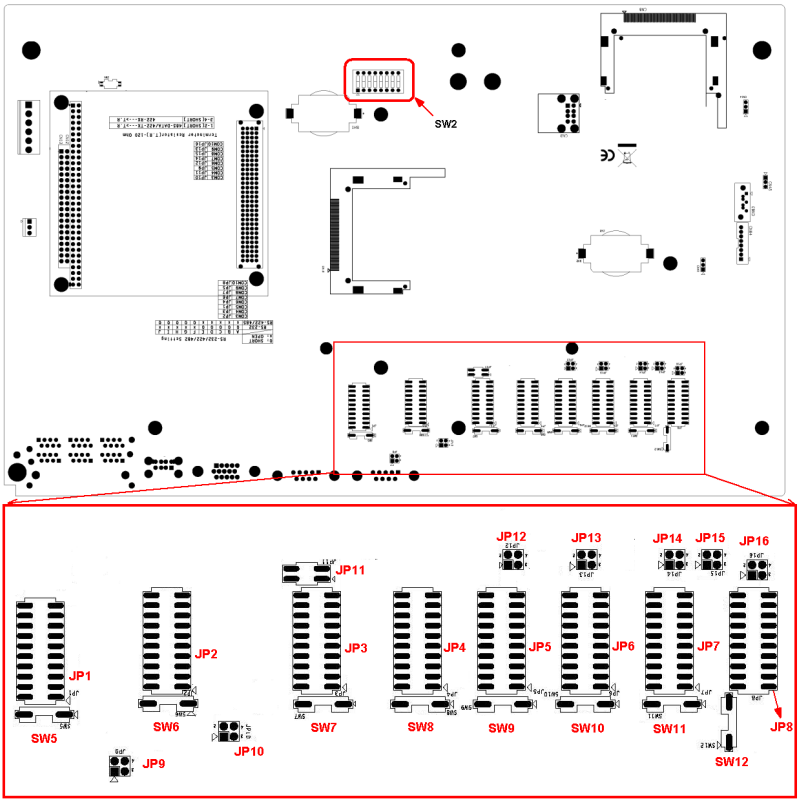


Figure 2.3: COM Port Related Jumper/Switch Locations

2.5.5 RS-232/422/485 Selection

COM3 ~ COM10 support RS-232, RS-422 and RS-485 interfaces. The system detects RS-422 or RS-485 signals automatically in RS-422/485 mode. To select between RS-422/485 and RS-232 for COM3 ~ COM10, adjust JP1 ~ JP8 and Table 2.9 shows the mapping table.

Jumper settings for RS-422/485 interface: (JP1 ~ JP8)

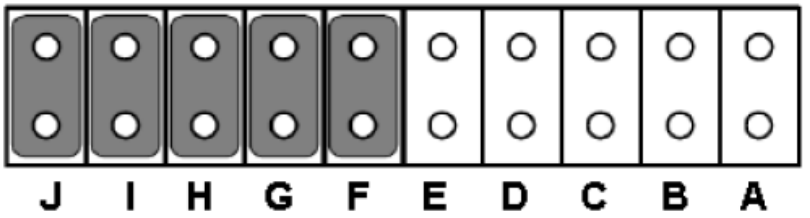


Figure 2.4: RS-422/485 Jumper Setting

Jumper settings for RS-232 interface: (Default setting) (JP1 ~ JP8)

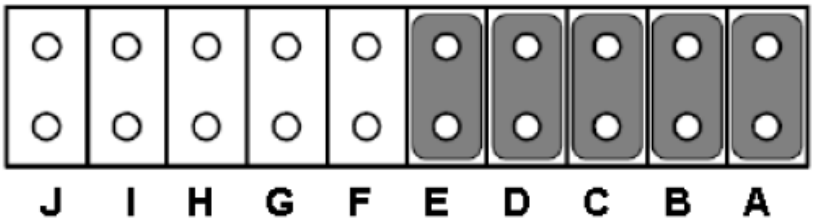


Figure 2.5: RS-232 Jumper Setting

2.5.6 RS-485 Auto Flow & RS-422 Master/Slave Modes

You can set the "Auto Flow Control" mode of RS-485 or "Master/Slave" mode of RS-422 by using the SW2 DIP switch for COM3~COM10. Please also refer to Table 2.9 for the COM port mapping with the DIP.

In RS-485, if the switch is set to "Off", the driver automatically senses the direction of the data flow and switches the direction of transmission. No handshaking is necessary.

In RS-422, if DIP switch is set to "On," the driver is always enabled, and always in high or low status. Please refer below for the default setting.

Table 2.10: SW2 DIP Setting

SW2 Status	Description
ON	RS-422: Master mode RS-485: N/A
OFF(Default)	RS-422: Slave mode RS-485: Auto flow control

2.5.7 Redundant RS-422 Matter

In the occasion that UNO-4672 RS-422 ports need to act as multi-master in parallel with other RS-422 master ports. Because of the auto detection function, the TX port will also receive data from other RS-422 master. To avoid this situation in this kind of application, user can use SW5~SW12 to turn it off, then no data will be received from TX port. Please refer to the Table 2.11 for the COM port mapping and refer to Figure 2.3 for the location.

Table 2.11: Mapping table of switches for COM port		
COM port	Switches	Status
COM3	SW6	ON: Normal (default) OFF: RS-422 multi-master
COM4	SW7	
COM5	SW5	
COM6	SW8	
COM7	SW10	
COM8	SW11	
COM9	SW9	
COM10	SW12	

2.6 LAN: Ethernet Connector

The UNO-4678 is equipped with 2 Intel 82541 PI Gigabit Ethernet Controller which are compliant with IEEE802.3 1000Base-T, 100Base-TX and 10Base-T (802.3, 802.3u and 802.3ab). And it is also equipped with 4 Realtek RTL8100CL Network controllers which are compliant with IEEE 802.3u 10/ 100Base-T CSMA/CD standards.

The Ethernet port provides a standard RJ-45 jack on board, and LED indicators on the front side to show its Link and Active status.

Please note these LAN controllers all use PCI resource, the bandwidth or throughput may be restricted by the PCI bandwidth.

2.7 USB Ports

The UNO-4672 provides four USB interface connectors, which provide complete Plug & Play and hot swapping for up to 127 external devices.

The USB interface complies with USB UHCI, Rev. 2.0 compliant. The USB interface can be disabled in the system BIOS setup.

UNO-4672 provides 1 USB port on the front panel, and 2 USB port on the rear panel. It also provides 1 USB port inside the chassis for USB dongle key.

2.8 VGA Display

The UNO-4672 provides a VGA controller (Intel 852 GME, supports a single 1.5V accelerated graphics port interface) for a high resolution VGA interface. CRT Mode: 1280 x 1024 @ 32bpp (60Hz), 1024 x 768 @ 32bpp (85Hz); LCD/Simultaneous Modes: 1280 x 1024 @ 16bpp(60Hz), 1024 x 768 @16bpp(60Hz) and up to 32 MB shared memory.

2.9 Battery Backup SRAM

UNO-4672 provides 512 KB of battery backup SRAM. This ensures that you have a safe place to store critical data. You can now write software applications without being concerned that system crashes will erase critical data from the memory.

There is a BTR LED in the front panel of the UNO-4672, please replace the lithium battery with a new one if the BTR LED is activated.

2.9.1 Lithium Battery Specifications

- **Type:** BR2032 (Using CR2032 is NOT recommended)
- **Output voltage:** 3 V_{DC}
- **Location:** the backside of UNO-4672 board.

  (BH1 is for real time clock, BH2 is for SRAM)

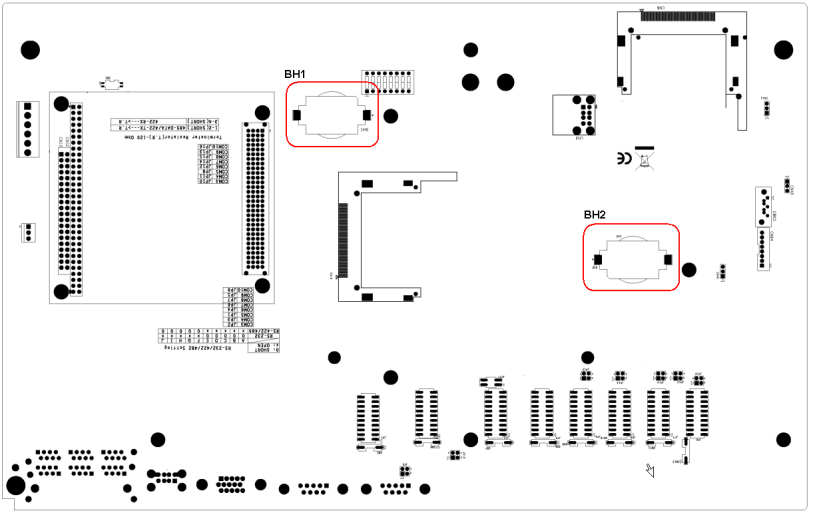


Figure 2.6: SRAM Lithium Battery Location

2.10 Onboard Isolated Digital Input

The UNO-4672 has 8 isolated DI channels designated DI0~DI7.

2.10.1 Pin Assignments

The connector type of UNO-4672 is plug-in screw terminal block that enables you to connect to field I/O devices directly without additional accessories. Figure 2.7 and Table 2.12 shows its pin assignment as well as signal description.

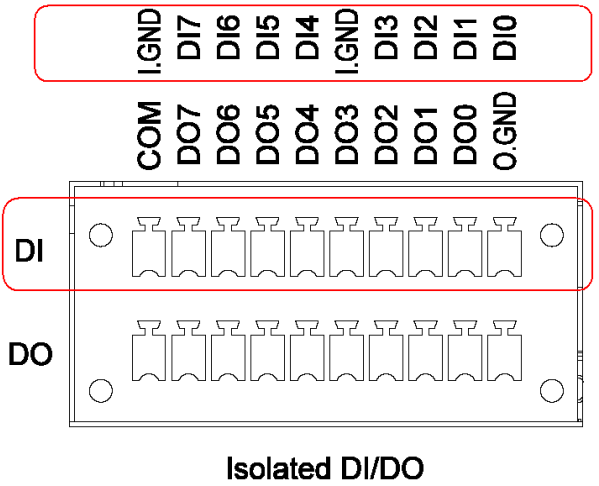


Figure 2.7: Digital Input Connector Pin Assignments

Table 2.12: Digital Input Connector Signal Description			
Signal Name	**Reference**	**Direction**	**Description**
DI <0...7>	I.GND	Input	Isolated DI signals
I.GND	-	-	DI isolated ground

2.10.2 Isolated Inputs

Each of isolated digital input channels accepts 0 ~ 50 VDC voltage inputs, and accepts bi-directional input. The voltage range is -3 ~ 3 VDC for logic 0 (low), -50 ~ -10 VDC and 10 ~ 50 VDC for logic 1 (high). It means that you can apply positive or negative voltage to an isolated input pin (Vin). All channels share two common pins (I.GND). Figure 2.8 shows how to connect an external input source to an UNO-4672 isolated input channel.

Please note that DI0 and DI2 may be configured as gate control pins of Counter 0 and Counter 1; While DI1 and DI3 may be configured as input pins of Counter 0 and Counter 1.

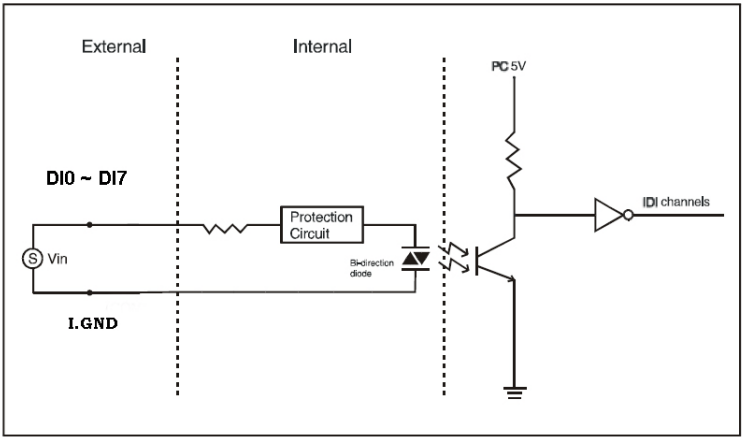


Figure 2.8: Isolated Digital Input Connection

2.10.3 Interrupt Function of the DI Signals

DI0 and DI1 can be used to generate hardware interrupts. Users can setup the configuration of them by programming the interrupt control register.

The channels are connected to the interrupt circuitry. Users can disable/enable interrupt function, select trigger type or latch the port data by setting the Interrupt Control Register of the UNO-4672. When the interrupt request signals occur, then the software will service these interrupt requests by ISR (Interrupt Service Routine). The multiple interrupt sources provide the card with more capability and flexibility.

2.10.4 IRQ Level

The IRQ level is by default set by the system BIOS. IRQ 7 is reserved for DI interrupt and counter interrupt.

2.10.5 Interrupt Control Register

Table 2.13: Interrupt Control Register Bit Map									
Base Address		7	6	5	4	3	2	1	0
202H	R/W	Interrupt Enable Control/Status Register							
								DI1EN	DI0EN
203H	R/W	Interrupt Triggering Edge Control/Status Register							
								DI1TE	DI0TE
207H	R/W	Interrupt Flag/Clear Register							
								DI1F	DI0F

The Interrupt Control Register controls the function and status of each interrupt signal source. Table 2.13 shows the bit map of the Interrupt Control Register. The register is readable/writeable register. While being written, it is used as a control register; and while being read, it is used as a status register.

DI0EN & DI1EN: DI0 & DI1 Interrupt disable/enable control bit

DI0TE & DI1TE: DI0 & DI1 Interrupt triggering edge control bit

DI0F & DI1F: DI0 & DI1 interrupt flag bit

2.10.6 Interrupt Enable Control Function

Table 2.14: Interrupt Disable/Enable Control	
DI0EN & DI1EN	**Interrupt Disable/Enable Control**
0	Disable
1	Enable

The user can choose to enable or disable the interrupt function by writing its corresponding value to the interrupt disable/enable control bit in the interrupt control register, as shown in Table 2.14.

2.10.7 Interrupt Triggering Edge Control

The interrupt can be triggered by a rising edge or a falling edge of the interrupt signal, as determined by the value in the interrupt triggering edge control bit in the interrupt control register, as shown in Table 2.15.

Table 2.15: Interrupt Triggering Edge Control

DI0TE & DI1TE	Triggering edge of interrupt signal
0	Falling edge trigger
1	Rising edge trigger

2.10.8 Interrupt Flag Bit

The interrupt flag bit is a flag indicating the status of an interrupt. It is a readable/writable bit. To find the status of the interrupt, you have to read the bit value. To clear the interrupt, you have to write "1" to this bit. This bit must first be cleared to service the next coming interrupt.

Table 2.16: Interrupt Flag Bit Values

DI0F & DI1F		Interrupt Status
Read	0	No interrupt
	1	Interrupt occur
Write	0	Don't care
	1	Clear interrupt

Note: *UNO-4672 provides built-in examples to show how to deliver digital input functionality. Refer to console mode examples in*

C:\Program Files\Advantech\UNO\UNO_IsaDIO\Examples\Console.

(Please install DI/O driver from the UNO CD to use these examples)

2.11 Onboard Isolated Digital Output

The UNO-4672 has 8 isolated DO channels designated DO0 ~ DO7.

2.11.1 Pin Assignments

The connector type of UNO-4672 is plug-in screw terminal block that enables you to connect to field I/O devices directly without additional accessories. Figure 2.9 and Table 2.17 show its pin assignment as well as signal description.

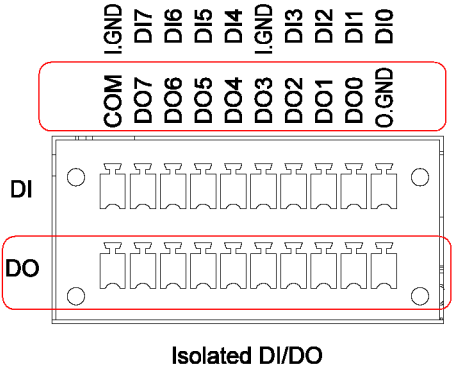


Figure 2.9: Digital Output Connector Pin Assignments

Table 2.17: Digital Output Connector Signals

Signal Name	Reference	Direction	Description
DO<0...7>	GND	Output	Isolated DO signals
O.GND	-	-	DO isolated ground
COM	-	-	DO_COM as using inductance load

2.11.2 Power On Configuration

Default configuration after power on or hardware reset is to set all the isolated digital output channels to open status (the current of the load can't be sink) so that users need not worry about damaging external devices during system startup or reset. When the system is hot reset, then the status of isolated digital output channels are selected by jumper CN40. Table 2.18 shows the configuration of jumper CN40.

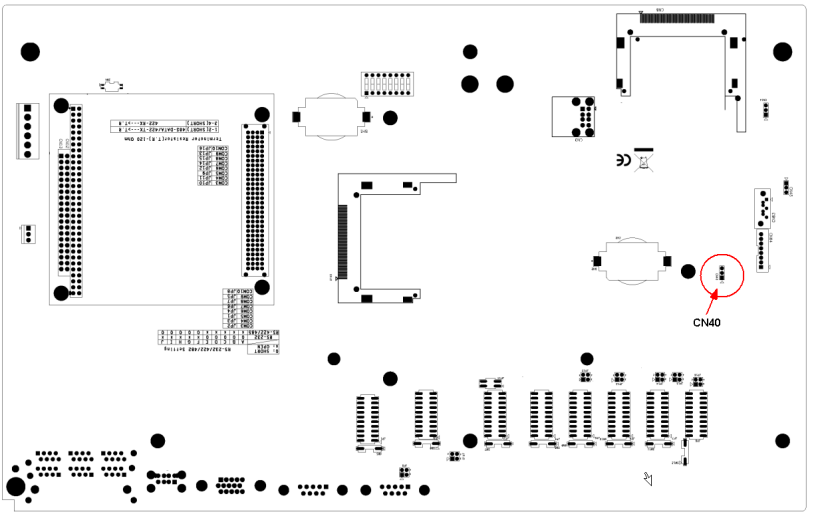
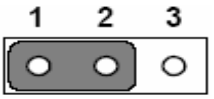
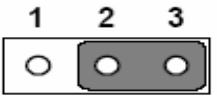


Figure 2.10: Location of CN40

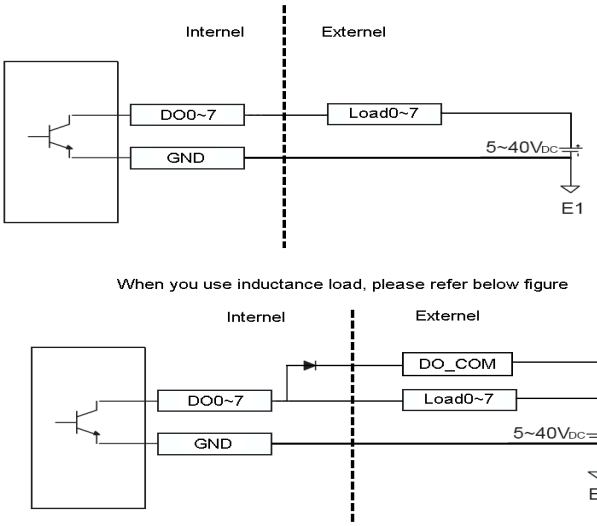
Table 2.18: Digital Output Power On Configuration

CN40	Power on configuration after hot reset
	Set to "Open" status Default setting
	Keep last status after hot reset

2.11.3 Isolated Outputs

Each of isolated output channels comes equipped with a Darlington transistor. All output channels share common emitters.

Please note that if an external voltage (5 ~ 40 VDC) is applied to an isolated output channel while it is being used as an output channel, the current will flow from the external voltage source to the UNO-4672. Please take care that the current through each DO pin not exceed 200 mA. Figure below shows how to connect an external output load to the UNO-4672 isolated outputs. Please note that DO2 and DO3 may be configured as output pins of Counter 0 and Counter 1.



Note: UNO-4672 provides built-in examples to show how to deliver digital output functionality. Refer to console mode examples in C:\Program Files\Advantech\UNO\UNO_IsaDIO\Examples\Console. (Please install DI/O driver from the UNO CD to use these examples)

2.12 Onboard Isolated Counter/Timer

The UNO-4672 uses one 82C54 programmable timer/counter chip that includes three independent 16-bit down counters: counter 0, counter 1 and counter 2. Counter 0 and counter 1 are for users, and counter 2 is specified for the system and can't be used by user. Each counter has clock input, gate input and pulse output. They can be programmed to count from 2 up to 65535 or cascaded into one 32-bit counter.

The UNO-4672 has two isolated counter input channels designated DI1 and DI3 with two isolated output channels designated DO2 and DO3. Therefore, you can set each counter of 82C54 as counter function or timer function.

2.12.1 Counter/Timer Control Register

The Counter/Timer Control Register controls the function and status of each counter/timer signal source. Table 2.19 shows the bit map of the Counter/Timer Control Register. The register is readable/writable register. While being written, it is used as a control register; and while being read, it is used as a status register.

Table 2.19: Counter/Timer Control Register Bit Map									
Base Address		**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
207H	R/W	Interrupt Flag/Clear Register							
						CTR1F	CTR0F		
208H	R/W	82C54 Chip Counter0 Register							
209H	R/W	82C54 Chip Counter1 Register							
20BH	R/W	82C54 Chip Control Register							
20CH	R/W	Counter0 Start Control / Output Status Register							
					CTR0 Out				CTR0 Gate
20DH	R/W	Counter1 Start Control / Output Status Register							
					CTR1 Out				CTR1 Gate
20EH	R/W	Counter0 Setting Register							
						CTR0 IntSet	CTR0 OutSet	CTR0 GateSet	CTR0 CLKSet
20FH	R/W	Counter1 Setting Register							
			CTR32 Set	S1	S0	CTR1 IntSet	CTR1 OutSet	CTR1 GateSet	CTR1 CLKSet

CTR0F/CTR1F: (Counter 0/1) interrupt flag bit

CTR0Gate/CTR1Gate: (Counter 0/1) gate control bit

CTR0Out /CTR1Out: (Counter 0/1) output status bit

CTR0CLKSet /CTR1CLKSet: (Counter 0/1) clock source control bit

CTR0GateSet/CTR1GateSet: (Counter 0/1) gate source control bit

CTR0OutSet/CTR1OutSet: (Counter 0 /1) output destination control bit

CTR0IntSet/CTR1IntSet: (Counter 0/1) interrupt control bit

S0/S1: (Counter 0/1) internal clock control bit

CTR32Set: Cascaded 32-bit counter control bit

2.12.2 Counter 0 Function Block

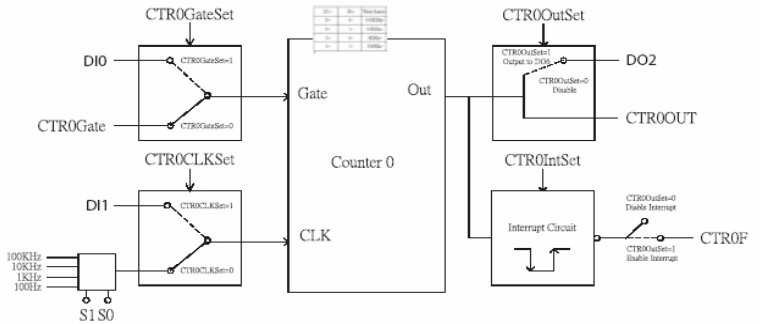


Figure 2.11: Counter 0 Function Block

2.12.3 Counter 1 Function Block

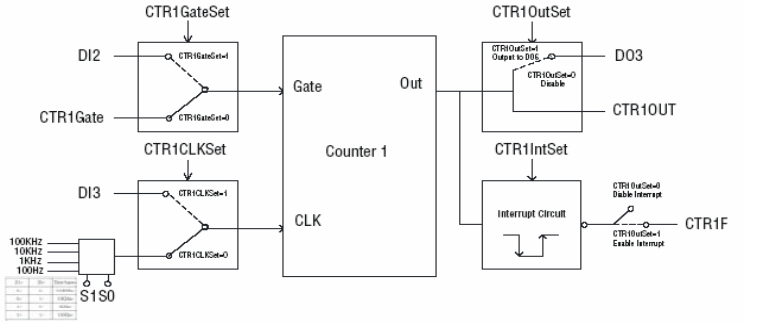


Figure 2.12: Counter 1 Function Block

2.12.4 32-bit Counter Function Block (CTR32Set=1)

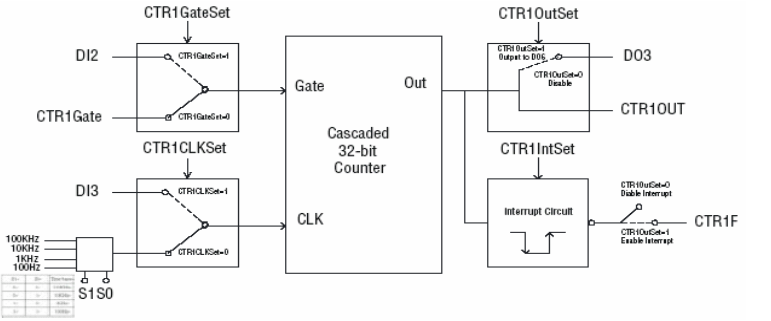


Figure 2.13: 32-bit Counter Function Block

2.12.5 Counter Clock Source

There are two clock sources available for the user counters by setting counter clock control bits - CTR0CLKSet and CTR1CLKSet.

Table 2.20: Counter Clock Source Control Bit		
CTR0CLKSet	0	Internal clock (default)
	1	External clock from digital input 1 (DI1) channel
CTR1CLKSet	0	Internal clock (default)
	1	External clock from digital input 3 (DI3) channel

2.12.6 Counter Internal Clock

There are four frequency options to choose according to applications, and it's set by internal clock control bits - S0 and S1.

Table 2.21: Counter Internal Clock Control Bit		
S1	**S0**	**Time base**
0	0	100 KHz (default)
0	1	10 KHz
1	0	1 KHz
1	1	100 Hz

2.12.7 Counter Gate Source

The gate sources you select determine what kind of gate input signal to enable your counter/timer when receiving clock input. There are two gate sources available for the user counters by setting gate source control bits - CTR0GateSet and CTR1GateSet.

Table 2.22: Counter Gate Source Control Bit		
CTR0GateSet	0	Gate source from "CTR0Gate" control bit (Default)
	1	Gate source from digital input 0 (DI0) channel
CTR1GateSet	0	Gate source from "CTR1Gate" control bit (Default)
	1	Gate source from digital input 2 (DI2) channel

2.12.8 Counter Output Destination

You can choose the output destination of counter 0 and counter 1 by setting "Output Destination control bits"- CTR0OutSet and CTR1OutSet.

Table 2.23: Counter Output Destination Control Bit		
CTR0OutSet	0	Output destination to "CTR0Out" status bit (Default)
	1	Output destination to "CTR0Out" status bit and digital output 2 (DO2) channel
CTR1OutSet	0	Output destination to "CTR1Out" status bit. (Default)
	1	Output destination to "CTR1Out" status bit and digital output 3 (DO3) channel

2.12.9 Counter Interrupt Flag

The interrupt flag bit is a flag indicating the status of an interrupt. It is a readable/writable bit. To find the status of the interrupt, you have to read the bit value; to clear the interrupt, you have to write "1" to this bit. This bit must first be cleared to service the next coming interrupt. Besides, you can choose if counter 0 or counter 1 generate interrupt signal by configuring "CTR0IntSet" and "CTR1IntSet" control bit.

Table 2.24: Counter Interrupt Flag Control Bit		
CTR0F, CTR1F		Counter Interrupt Status
Read	0	No interrupt
	1	Interrupt occur
Write	0	Don't care
	1	Clear interrupt
CTR0IntSet, CTR1IntSet		Counter Interrupt Control
0		Disable (Default)
1		Enable

2.12.10 Cascaded 32-bit Counter

You can also cascade counter 0 and counter 1 together as one 32-bit counter/timer, and it's configured by control bit - CTR32Set.

Table 2.25: 32-bit Counter Control Bit	
0	Disable (Default)
1	Cascade counter 0 and counter 1 into one 32-bit counter

Note: UNO-4672 provides built-in examples to show how to deliver counter functionality. Refer to console mode examples in C:\Program Files\Advantech\UNO\UNO_IsaDIO\Examples\Console. (Please install DI/O driver from the UNO CD to use these examples)

2.13 LED and Buzzer for System Diagnosis

In a "headless application" (an application without a monitor display), it is always difficult to know the system status. Another PC may be needed to monitor a headless device's status via RS-232 or Ethernet. In order to solve this problem, UNO-4672 offers a programmable LED indicator and buzzer. They can be programmed to show a systems status by LED indicator flickering and buzzer alarm.

Table 2.26: LED & Buzzer Control Register									
Base Address		7	6	5	4	3	2	1	0
210H	R/W	DIAG LED Register							
							LEDS1	LEDS0	LEDEn
211H	R/W	Buzzer Register							
							SPKS1	SPKS0	SPKEn
214H	R/W	LED 0~7							
		LED7	LED6	LED5	LED4	LED3	LED2	LED1	LED0

LEDEn: =0, DIAG LED disable

=1, DIAG LED enable

LEDS0 and LEDS1: LED flickering speed setting bit (refer to Table 2.16)

SPKEn: =0, Speaker disable

=1, Speaker enable

SPKS0 & SPKS1: Buzzer alarming setting bit (refer to Table 2.17)

LED<0...7>: = 0, LED turns off

= 1, LED turns on

Note: UNO-4672 provides built-in examples to show how to configure DIAG LED and Buzzer. Refer to console mode examples in C:\Program Files\Advantech\UNO\UNO_IsaDIO\Examples\Console.

(Please install DI/O driver from the UNO CD to use these examples)

Table 2.27: Programmable LED Control Bit

	LEDS1	**LEDS0**
Light on	0	0
Fast flicker	0	1
Normal flicker	1	0
Short flicker	1	1

Table 2.28: Programmable Buzzer Control Bit

	SPKS1	**SPKS0**
Beep on	0	0
Short beep	0	1
Normal beep	1	0
Long beep	1	1

2.14 PC/104+

UNO-4672 supports standard PC/104+ version 1.2, which supports up to 3 PCI masters (CN11). You also could install jumper (CN14) for choosing power of PC/104+ bus supplies (Jumper default setting is open).

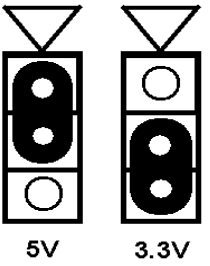


Figure 2.14: PC104+ Power Selection

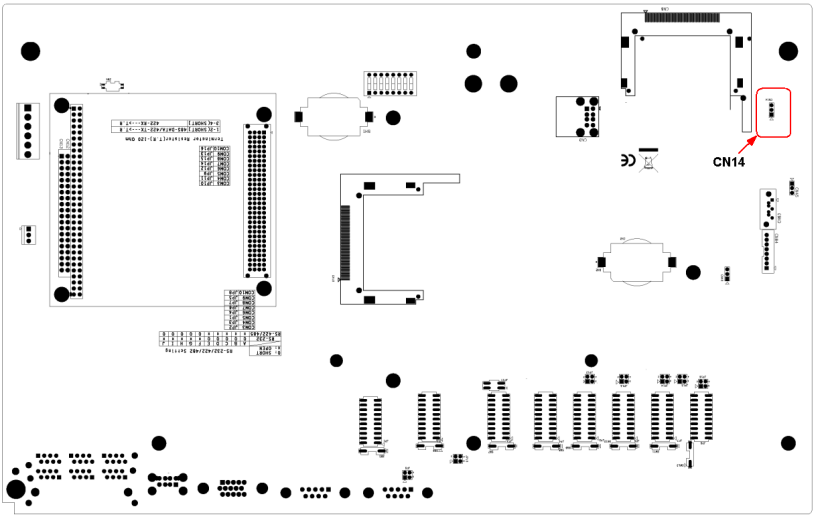


Figure 2.15: CN14 Location

CHAPTER 3

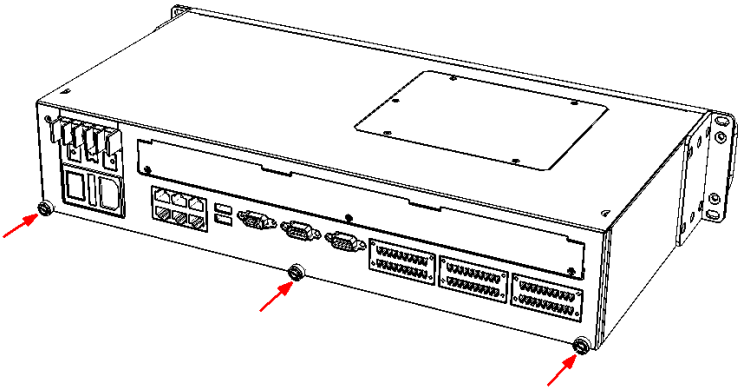
Initial Setup

Chapter 3 Initial Setup

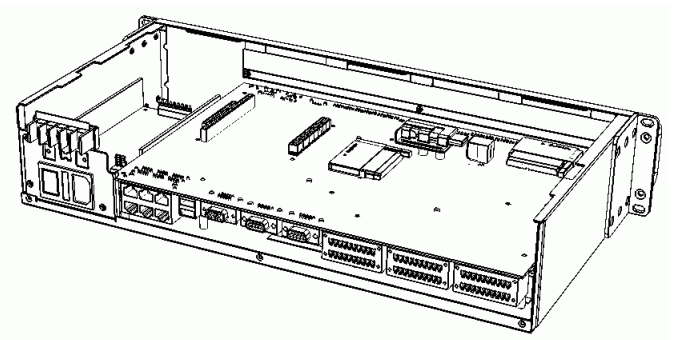
3.1 Configuration

To open the chassis, please follow the steps below:

1. Remove all power and signal connections
2. Place the unit heat-sink side down
3. Remove the screws shown below



4. Remove the L-shaped cover



Note: If an HDD is installed, please remove any HDD related connections before opening the chassis.

3.2 Install a CompactFlash Card

UNO-4672 provides 2 CompactFlash Card slots, to install the cards:

1. Please follow 3.1 to open the chassis.
2. Insert the card at the location (CN8, CN10) shown below.

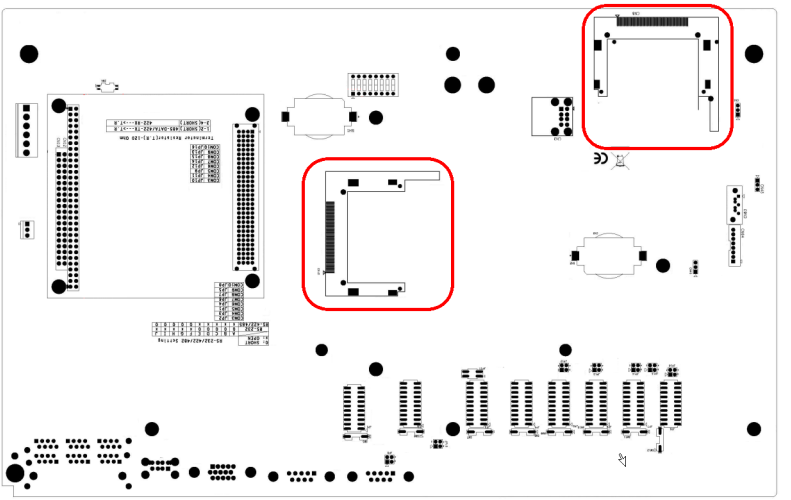


Figure 3.1: CompactFlash Card Slot Location

3.3 Installing a USB Dongle

UNO-4672 provides a clamp to fix the USB dongle which can be installed inside the chassis. Please follow the steps to install the USB dongle and clamp:

1. Please follow 3.1 to open the chassis.
2. Plug the USB Dongle in the upside port of CN3, please note the downside port is a dummy port.

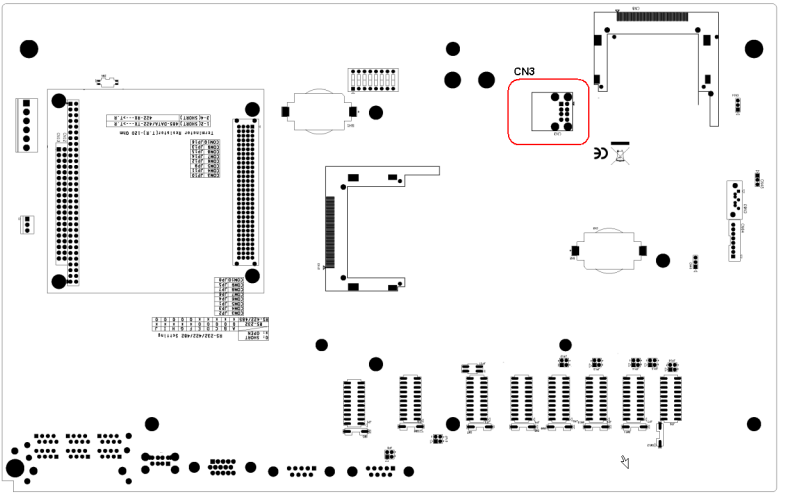
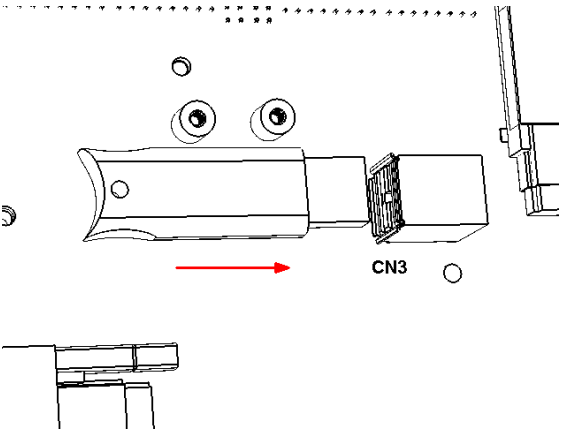
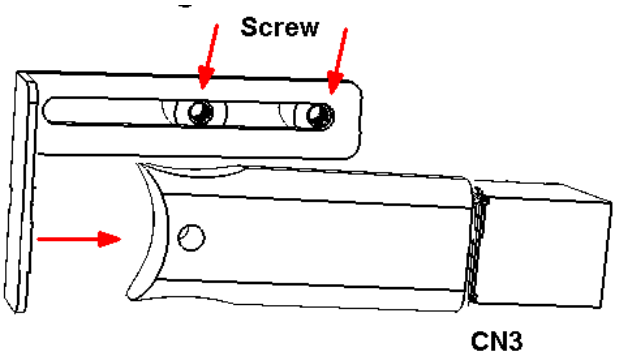


Figure 3.2: CN3 Location of Internal USB Port



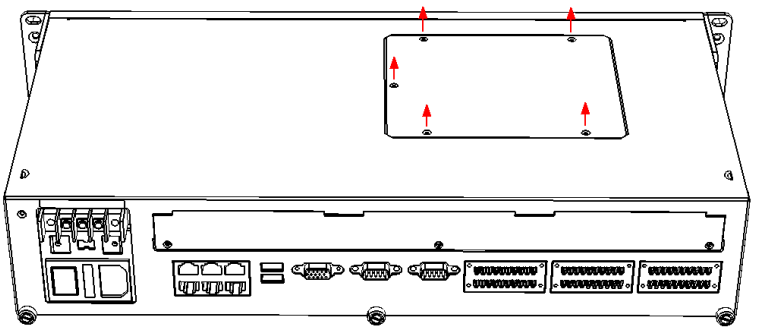
3. Adjust the position of the kit to fasten the USB dongle, and then screw to fix the kit.



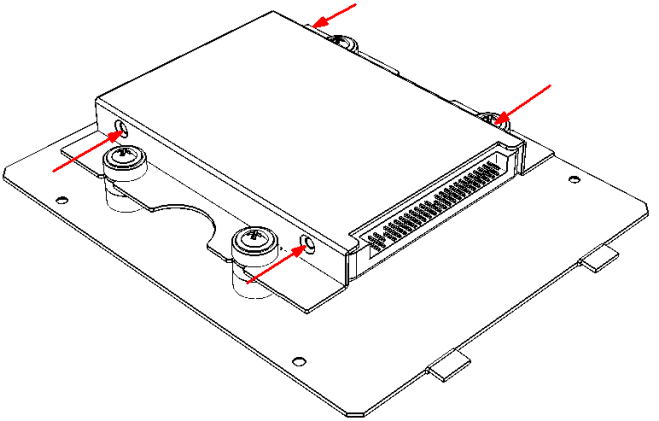
3.4 Installing a Hard Disk

Please follow the steps below to install an HDD:

1. Turn the unit heat-sink side down.
2. Unscrew the 5 screws and remove the HDD bay.



3. Insert the HDD into the HDD bay and screw it.



4. Connect the SATA cable between HDD and connector then assemble the HDD back to the chassis. The locations of the connectors are shown below, SATA signal connector locates on CN63 and SATA power connector locates on CN64.

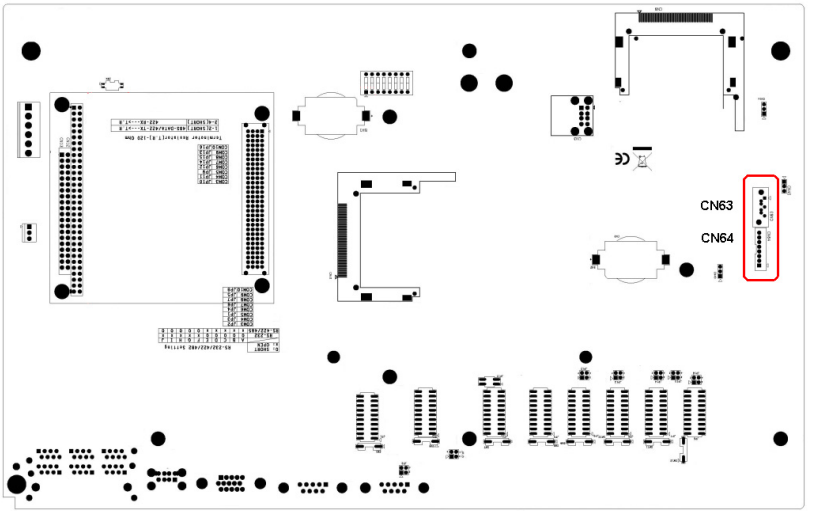
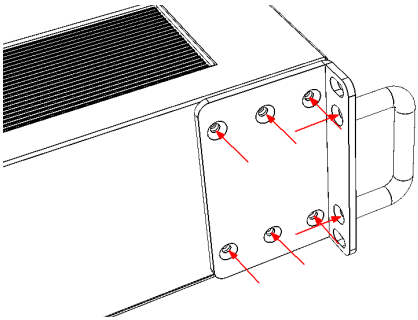


Figure 3.3: SATA Signal and Power Connector Location

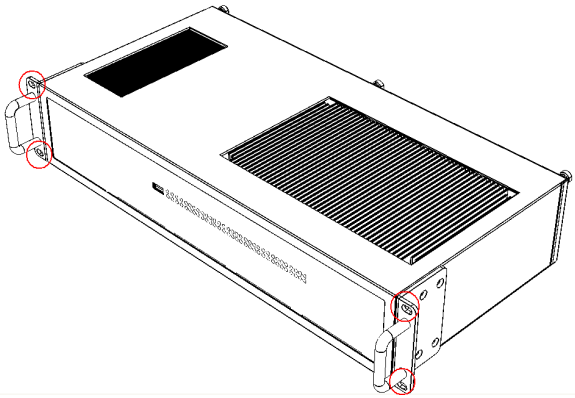
3.5 Installation on Rack

UNO-4672 provides the kits for Rack mounting in the accessory box.

1. Please screw the ears and handles at the position indicated below. The same on the other side.



2. Use the 4 screw holes to mount the UNO-4672 on the rack.



3. UNO-4672 equips the Aluminum Fins on the top of the unit as heat-sink. It can generate nature convection for better heat transmission. To have optimal thermal performance, please leave 2U (440 mm) space height on the top of the unit

3.6 BIOS Setup and System Assignments

UNO-4672 adopts Advantech's SOM-4486 and SOM-4481 CPU module. Further information about the SOM module, can be found in SOM's user's manual. You can find this manual on the UNO-4672's companion DISC.

Please note that you can try to "LOAD BIOS DEFAULTS" from the BIOS Setup manual if the UNO-4672 does not work properly.

Appendix A

System Settings and Pin Assignments

Appendix A System Settings & Pin Assignments

A.1 System I/O Address & Interrupt Assignments

Table A.1: UNO-4672 System I/O Ports

Address Range	Device
000-01F	DMA controller (slave)
020-03F	Interrupt controller 1, (master)
040-05F	8254 timer/counter
060-06F	8042 (keyboard controller)
070-07F	Real-time clock, non-maskable interrupt (NMI)mask
080-09F	DMA page register,
0A0-0BF	Interrupt controller 2 (slave)
0C0-0DF	DMA controller (master)
0F0	Clear math co-processor
0F1	Reset math co-processor
0F8-0FF	Math co-processor
1D0	Vector address; for COM port share IRQ
1E0	Battery backup resource
11E	Battery backup resource
1F0-1F8	1st fixed disk
200-218	Digital inputs, outputs and counter
278-27F	Reserved
2F8-2FF	Serial port 2
380-38F	SDLC, bisynchronous 2
3A0-3AF	Bisynchronous 1
3B0-3BF	Monochrome display
3C0-3CF	Reserved
3D0-3DF	Color/graphics monitor adapter
3F0-3F7	Diskette controller
3F8-3FF	Serial port 1
443	Reserved for standard 443 Watchdog Timer
DC000-DFFFF	Battery backup resource

Table A.2: UNO-4672 Interrupt Assignment

Interrupt No.	Interrupt Source
NMI	Parity error detected
IRQ 0	Interval timer
IRQ 1	Keyboard
IRQ 2	Interrupt from controller 2 (cascade)
IRQ 3	COM2
IRQ 4	COM1
IRQ 6	Diskette controller (FDC)
IRQ 7	Digital inputs, outputs and counter
IRQ 8	Real-time clock
IRQ 11	Reserved for watchdog timer
IRQ 12	PS/2 mouse
IRQ 13	INT from co-processor
IRQ 14	Primary IDE
IRQ 15	Secondary IDE for CompactFlash

A.2 RS-232/422/485 Serial Ports (COM1~COM10)

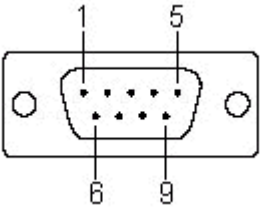
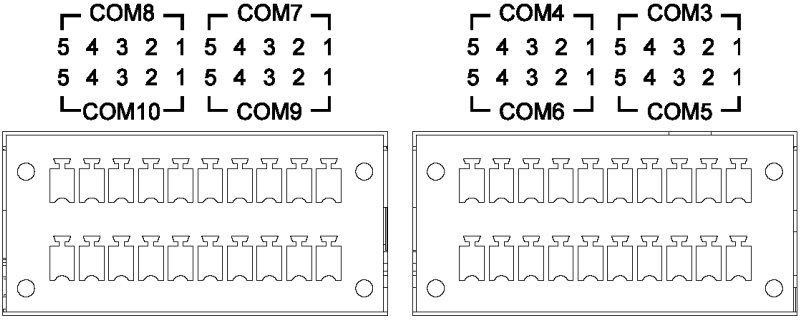


Table A.3: RS-232 Serial Ports COM1~2

Pin	RS-232
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI



Isolated RS-232/422/485 Isolated RS-232/422/485

Table A.4: RS-232/422/485 Serial Ports (COM3~10)

Pins	RS-232	RS-422	RS-485
1	RxD	Tx+	Data+
2	TxD	Tx-	Data-
3	RTS	Rx+	-
4	CTS	Rx-	-
5	GND	GND	GND

A.3 USB Connectors (USB1~USB2)

Table A.5: USB Connector Pin Assignments

Pin	Signal Name	Cable Color
1	VCC	Red
2	DATA-	White
3	DATA+	Green
4	GND	Black

A.4 VGA Display Connector

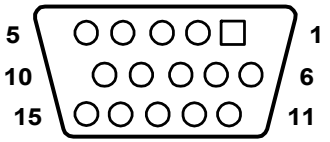


Table A.6: VGA Adaptor Cable Pin Assignments

Pin	Signal Name
1	Red
2	Green
3	Blue
4	NC
5	GND
6	GND
7	GND
8	GND
9	NC
10	GND
11	NC
12	NC
13	H-SYNC
14	V-SYNC
15	NC

A.5 UNO-4672 Control Register

Table A.7: UNO-4672 Control Register									
Base Address		7	6	5	4	3	2	1	0
200H	R	Isolated Digital Input Status Register							
		DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0
201H	R/W	Isolated Digital Output Control/Status Register							
		DO7	DO6	DO5	DO4	DO3	DO2	DO1	DO0
202H	R/W	Interrupt Enable Control/Status Register							
								DI1EN	DI0EN
203H	R/W	Interrupt Triggering Edge Control/Status Register							
								DI1TE	DI0TE
207H	R/W	Interrupt Flag/Clear Register							
						CTR1F	CTR0F	DI1F	DI0F
208H	R/W	82C54 Chip Counter0 Register*							
209H	R/W	82C54 Chip Counter1 Register*							
20BH	R/W	82C54 Chip Control Register*							
20CH	R/W	Counter0 Start Control / Output Status Register							
					CTR0 Out				CTR0 Gate
20DH	R/W	Counter1 Start Control / Output Status Register							
					CTR1 Out				CTR1 Gate
20EH	R/W	Counter0 Setting Register							
						CTR0 IntSet	CTR0 OutSet	CTR0 GateSet	CTR0 CLKSet
20FH	R/W	Counter1 Setting Register							
			CTR 32Set	S1	S0	CTR1 IntSet	CTR1 OutSet	CTR1 GateSet	CTR1 CLKSet
210H	R/W	DIAG LED Control Register							
							LEDS1	LEDS0	LEDEn
211H	R/W	Buzzer Control Register							
							SPKS1	SPKS0	SPKEn
214H	R/W	LED 0~7							
		LED7	LED6	LED5	LED4	LED3	LED2	LED1	LED0
218H	R	Power Register							
							PWR	P2	P1

** Refer to 82c54 manual*

Appendix B

Programming the Watchdog Timer

Appendix B Watchdog Timer Programming

B.1 UNO-4672

Below is a sample of programming code for controlling the Watchdog Timer function.

```
---------------------------------------------------------------------------
Enter the extended function mode, interruptible double-write |
---------------------------------------------------------------------------
MOV DX,2EH
MOV AL,87H
OUT DX,AL
OUT DX,AL
---------------------------------------------------------------------------
Configured logical device 8, configuration register CRF6 |
---------------------------------------------------------------------------
MOV DX,2EH
MOV AL,2BH
OUT DX,AL
MOV DX,2FH
IN AL,DX
AND AL.OEFH;Setbit 4=0 Pin 89=WDTO
OUT DX,AL
MOV DX,2EH
MOV AL,07H; point to Logical Device Number Reg.
OUT DX,AL
MOV DX,2FH
MOV AL,08H; select logical device 8
OUT DX,AL;
MOV DX,2EH
MOV AL,30H;Set watch dog activate or inactivate
```

```
OUT DX,AL
MOV DX,2FH
MOV AL,01H; 01:activate 00:inactivate
OUT DX,AL;
MOV DX,2EH
MOV AL,F5H; Setting counter unit is second
OUT DX,AL
MOV DX,2FH
MOV AL,00H
OUT DX,AL;
MOV DX,2EH
MOV AL,F6H
OUT DX,AL
MOV DX,2FH
MOV AL,05H; Set 5 seconds
OUT DX,AL
;-----------------------------------------
; Exit extended function mode |
;-----------------------------------------
MOV DX,2EH
MOV AL,AAH
OUT DX,AL
```

Appendix C

Enabling the Advantech 443 WDT

Appendix C Enabling the Advantech 443 WDT

UNO-4672 reserves another set of Watchdog Timer for customer's special need. The default is disabled, and please refer to the following instructions to enable the function.

C.1 Hardware Settings

The jumpers and switches on CN45 and SW4 are related to the reserved Advantech 443 WDT function. Please refer to Figure C.1 and Table C.1 for the location and function.

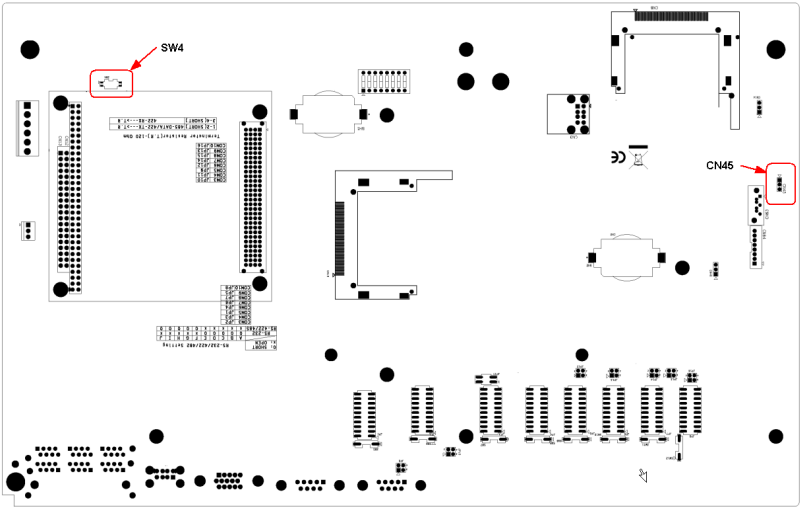


Figure C.1: Location of CN45 and SW4 for Standard 443 WDT

Table C.1: CN45 and SW4 Descriptions			
Location	Pin	Status	Description
CN45	1-2	Close	DO7 is normal (default)
	2-3	Close	DO7 link to 443 WDT output
SW4	DIP 1	On	443 WDT can reset the system
		Off	443 WDT doesn't link to reset pin (default)
	DIP2	On	443 WDT can trigger the LED in the front panel (WDT)
		Off	443 WDT doesn't link to LED (default)

C.2 Software Operation

To program the watchdog timer, you must write a program which writes I/O port address 443 (hex). The output data is a value of time interval. The value range is from 01 (hex) to 3E (hex), and the related time interval is 1 sec. to 62 sec.

Data Time Interval

01 1 sec.

02 2 sec.

03 3 sec.

04 4 sec.

..

..

3E 62 sec.

After data entry, the program must refresh the watchdog timer by rewriting the I/O port 443 (hex) while simultaneously setting it. When user want to disable the watchdog timer, the program should read I/O port 443 (hex).

The following example shows how to program the watchdog timer in BASIC:

```
10 REM Watchdog timer example program
20 OUT &H443, data REM Start and restart the watchdog
30 GOSUB 1000 REM Your application task #1,
40 OUT &H443, data REM Reset the timer
50 GOSUB 2000 REM Your application task #2,
60 OUT &H443, data REM Reset the timer
70 X=INP (&H443) REM, Disable the watchdog timer
80 END
1000 REM Subroutine #1, your application task
..
..
..
1070 RETURN
2000 REM Subroutine #2, your application task
..
..
..
2090 RETURN
```